CLAIMS

WHAT IS CLAIMED IS:

1. A method comprising:

transforming an image into a plurality of spatial frequency bands;

calculating average values for each of the spatial frequency bands; and

adjusting a relative amplitude of different ones of the spatial frequency bands to generate a modified image using an adjustment value associated with the average values.

2. The method of claim 1 further comprising defining the spatial frequency bands in octaves by the ratios $f_N/2^{M+1}$: $f_N/2^M$ for M=1..6 where $f_N/2$ is a Nyquist frequency of the sampling method.

3. The method of claim 1 further comprising defining each spatial frequency band as being a frequency interval small enough with the plurality of the frequency bands remaining a large enough interval in order for the plurality of spatial frequency bands to approximate a continuous function of spatial frequency.

4.. The method of claim 1 further comprising weighting each of the spatial frequency bands by a Contrast Sensitivity Function (CSF) value and a Modulation Transfer Function (MTF) ratio value before performing the adjusting.

5. The method of claim 1 further comprising weighting each of the spatial frequency bands by a Contrast Sensitivity Function (CSF) value before performing the adjusting.

6. The method of claim 1 further comprising weighting each of the spatial frequency bands by a Modulation Transfer Function (MTF) ratio value before performing the adjusting.

7. The method of claim 1 further comprising separating the image into luminance and chromatic components, and then processing the method with the luminance component, where the chromatic component remains unchanged.

8. The method of claim 1 further comprising normalizing the modified image to preserve an overall power of the image.

9. The method of claim 1 wherein the adjusting further includes normalizing a total average of the average values to preserve an original average lightness associated with the image.

10. The method of claim 1 further comprising scaling the adjustment value by a configurable and selectable sharpness factor.

11. A method comprising:

transforming an image into a plurality of spatial frequency bands;

calculating an average pixel value at each of the spatial frequency bands;

calculating a mean Contrast Sensitivity Function (CSF) value at each of the spatial frequency bands;

calculating a mean Modulation Transfer Function (MTF) ratio value at each of the spatial frequency bands;

combining each average pixel value, each mean CSF value, and each MTF ratio value into an adjustment value; and

adding the adjustment value to each pixel value of the image to generate a modified image.

12. The method of claim 11 wherein the transforming further includes generating the spatial frequency bands by a set of convolution kernels of diameter $2^M - 1$ pixels, wherein M is an integer that begins at 1 and continues to 6 or greater.

13. The method of claim 11 wherein the adding further includes adding a non-linear function of a weighted sum of the average values for each of the spatial frequency bands to each of the pixel values.

14. The method of claim 11 wherein the calculating of the mean CSF value at each of the spatial frequencies further includes using an expected viewing distance of an average observer who views the modified image.

15. The method of claim 11 wherein the calculating of the mean MTF value at each of the spatial frequencies further includes using on an ideal MTF value for a display that presents the modified image.

16. The method of claim 11 wherein the combining further includes obtaining a total average for each of the average pixel values, each of the mean CSF values, and each of the MTF values, and wherein the total average is the adjustment value.

17. The method of claim 11 further comprising separating the image into luminance and chromatic components, the then processing the method with the luminance component, where the chromatic component remains unchanged.

18. The method of claim 11 wherein the adjusting further includes multiplying by a customized sharpness factor in the range of 0 to 1.

19. A system, comprising:

a display to present an image;

an image sharpness manager that communicates with the display, wherein the image sharpness manager processes each pixel of the image relative to a plurality of spatial frequency bands and adjusts the value of each processed pixel based on a function of the average values of the spatial frequency bands.

20. The system of claim 19 further comprising a device that implements the image sharpness manager, wherein the device is at least one of a digital camera, a phone, an appliance, intelligent apparel, a computing device, a computing peripheral device, and a television.

21. The system of claim 19, wherein each spatial frequency band is defined by a region of diameter 2^M-1 pixels, where M is an integer number that begins with 1 and continues to at least 6.

22. The system of claim 19, wherein the value for each processed pixel is adjusted to enhance the image for at least one of contrast, spatial losses, and sharpness.

23. The system of claim 19, wherein the function includes factors for mean Contrast Sensitivity Function (CSF) values and Modular Transfer Function (MTF) ratio values in each of the spatial frequency bands.

24. The system of claim 19, wherein the value is adjusted in order to alter the image based on an expected viewing distance of an observer.

25. The system of claim 19, wherein the image is first separated into luminance and chromatic components, then the luminance component of each pixel value is adjusted, where the chromatic component remains unchanged.

26. A computer readable medium having instructions thereon, the instructions when executed perform a method, the method comprising:

transforming an image into a plurality of spatial frequency bands;

calculating average values for each of the spatial frequency bands;

weighting each of the spatial frequency bands by weighted values; and

adjusting a relative amplitude of different ones of the spatial frequency bands using the average and weighted values to generate a modified image.

27. The medium of claim 26 further including the instructions of separating the image into luminance and chromatic components, the then processing the instructions on the medium with the luminance component, where the chromatic component remains unchanged.

28. The medium of claim 26 wherein the weighting instructions further include weighting each of the spatial frequency bands by a Contrast Sensitivity Function (CSF) value and including as a first portion of the weighted values.

29. The medium of claim 28 wherein the weighting instructions further include weighting each of the spatial frequency bands by a Modulation Transfer Function (MTF) ratio value and including as second portion of the weighted values.

30. The medium of claim 29 wherein the weighting instructions further include defining the CSF value based on an expected viewing distance of an average observer who views the modified image and defining the MTF ratio value based on an ideal MTF ratio value for a display that presents the modified image.